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PATENT ABSTRACTS OF JAPAN

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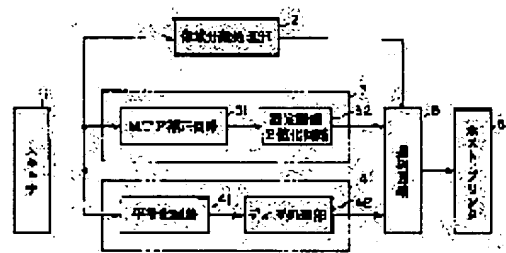
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(54) DIGITAL IMAGE READER

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent the degradation of a reproduced image by imparting a decision circuit selecting the binarization processing data due to a dither processing or an error diffusion to a sub-scanning direction intermediate density edge area in an image area separation processing.

SOLUTION: This device has an image area separation means 2 deciding whether the picture element under consideration in an inputted image is a character area or a pattern area and a means 5 selecting either one of means of a pressing means 3 taking preference of resolution and a processing means 4 taking preference of gradation, based on the detection result of the image area separation means 2. The image separation means 2 is provided with an edge area detection means changing from the white ground background of a sub-scanning direction to intermediate density, is provided with a processing means deciding that the edge area is the pattern area and prevents the degradation of a reproduced image.



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3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to a digital image reader and the image area decollator which divides an alphabetic character field and a pattern field into high degree of accuracy at details more.

[0002]

[Description of the Prior Art] After separating an alphabetic character field and a pattern field, for example, carrying out MTF amendment to an alphabetic character field generally as indicated by JP,5-176167,A, JP,5-308516,A, JP,6-150059,A, etc. when carrying out image area separation of the image in a small hard amount and performing binary-ized processing accommodative, it is made binary with a fixed threshold, dithering or binary-ized processing by error diffusion is performed to a pattern field, and the gradation nature of the resolution of an alphabetic character and a pattern is reconciled.

[0003] The combination of the density conversion by the digital operation which carried out interpolation amendment in the main scanning direction, and the density conversion to which the conveyance speed of the transit object of the direction of vertical scanning or a manuscript was changed is performing the switch of the reading density in a digital image reader.

[0004] In the aforementioned image area separation processing, in order to perform image area separation good to the data read by these various densities, it was carrying out by switching the threshold which mainly judges the connectivity of a field and which can curtain.

[0005] In recent years, quality improvement of a printer output unit progresses and the output units of high resolution are increasing in number. When outputting the binary-ized data information scanned by low reading density from the output unit of these high resolutions, in order to double rendering size, amplification processing is carried out and it outputs. For example, when outputting the bit map data read by A4 size:200dpi in A4 size from a 400dpi output printer, every direction makes it twice and area and is expanded by 4 times.

[0006]

[Problem(s) to be Solved by the Invention] In this case, since it will be emphasized by amplification processing if an incorrect isolation region exists, much more highly precise image area separation processing is desired. However, according to the experiment of these people, in the above-mentioned image area decollator, since the edge of the direction of vertical scanning of a pattern was incorrectly-judged to be an alphabetic character field in the above-mentioned case and fixed threshold binary-ized data was chosen as this field, the rendering quality of an image had deteriorated. Moreover, when a pattern portion is high concentration, the account edge of an account does not produce sense of incongruity visually, even if the black data based on fixed threshold binary-ized data appears, but when a pattern portion is not high concentration, since the concentration difference is sudden, sense of incongruity is produced, and the rendering quality of an image deteriorates remarkably.

[0007] This invention is by having been made in order to cancel the defect of **** conventionally [above-mentioned], detecting the edge field which changes from the low-concentration field of the

direction of vertical scanning to a medium concentration field in said adaptation judging (image-area separation) processing, and giving the judgment circuit which chooses the binary-ized processed data based on dithering or error diffusion to the direction medium concentration edge field of vertical scanning to prevent deterioration of the above-mentioned rendering image.

[0008]

[Means for Solving the Problem] An image area separation means to judge whether invention of claim 1 is whether an attention pixel in an input image is an alphabetic character field, and a pattern field, In a digital image reader equipped with a processing means to give priority to resolution, and a means to choose which means among processing means to give priority to gradation nature, based on a detection result of an image area separation means Said image area separation means possesses an edge field detection means to change from a white background of the direction of vertical scanning to medium concentration. It is characterized by having a processing means to judge that said edge field is a pattern field. It has and an edge field which changes from a low concentration field of the direction of vertical scanning to a medium concentration field is detected. In the direction medium concentration edge field of vertical scanning Deterioration of a rendering image is prevented by giving a judgment circuit which chooses binary-ized processed data based on dithering or error diffusion.

[0009] In invention of claim 1, an edge field detection means to change from a white background of sub***** to medium concentration invention of claim 2 A means to judge whether it is said edge field about this attention pixel based on a judgment result of the near (mxn pixel) field to an attention pixel is provided. It is characterized by having a means to change said near (mxn pixel) area size, according to reading density, and has it. Medium concentration edge field judging processing of the direction of vertical scanning of claim 1 A filter circuit of a mxn pixel field, It consists of a circuit which judges the connectivity of a field, and deterioration of the above-mentioned rendering image is prevented with a more sufficient precision according to reading density or a manuscript by changing a threshold which judges connectivity according to reading density or a manuscript.

[0010] In invention of claim 1, an edge field detection means to change from a white background of the direction of vertical scanning to medium concentration invention of claim 3 Connectivity is judged from size relation of an attention pixel and near (mxn pixel) to a threshold. A means to judge whether it is said edge field about this attention pixel based on the result is provided. It is characterized by having a means to change magnitude of said threshold, according to reading density, and has it. Medium concentration edge field judging processing of the direction of vertical scanning of claim 1 A filter circuit of a mxn pixel field, It consists of a circuit which judges the connectivity of a field, and deterioration of the above-mentioned rendering image is prevented with a more sufficient precision according to reading density or a manuscript by changing a threshold which judges connectivity according to reading density or a manuscript.

[0011] A means by which invention of claim 4 judges connectivity in invention of claim 1 from size relation of an attention pixel and near (mxn pixel), [as opposed to a threshold in an edge field detection means to change from a white background of the direction of vertical scanning to medium concentration] When a pixel which has said connectivity near the attention pixel from the result exists more than a predetermined individual, By being characterized by having an amendment means to judge that an attention pixel is said edge field, having it, and performing expansion processing of a mxn pixel to a medium concentration edge field judging result of the direction of vertical scanning According to reading density or a manuscript, deterioration of the above-mentioned rendering image is prevented with a more sufficient precision.

[0012]

[Embodiment of the Invention] Drawing 1 is a block block diagram for explaining one example of the image reader of this invention, and a scanner 1 has optoelectric transducers, such as a CCD camera, reads a manuscript, outputs a monochrome shade signal, and changes and outputs the shade signal to a 6-bit digital signal. the image area separation processing section 2 consists of the edge field detector 21, a white background detector 22, a vertical-scanning medium concentration edge detector 23, and a judgment circuit 24, and outputs a judgment result for every pixel so that drawing 2 may be resembled

and it may be shown. The gradation nature priority-processing section 4 which becomes this image reader from the resolution priority-processing section 3 which consists of an MTF amendment circuit 31 and a fixed threshold binary-sized circuit 32, and the smoothing circuit 41 and the dithering section 42 further is formed. The selection circuitry 5 which chooses a picture signal chooses any of the image by which the resolution priority processing was carried out, and the image by which the gradation nature priority processing was carried out they are according to the judgment signal from the image area separation processing section 2, and outputs it to a host or a printer 6. [it]

[0013] Drawing 2 is drawing showing the configuration of the image area separation processing section 2 shown in drawing 1, and consists of the edge field detector 21, a white background detector 22, a medium concentration edge detector 23 of the direction of vertical scanning, and a judgment circuit 24 as mentioned above in this image area separation processing section. The judgment processing in the image area separation processing section 2 is as follows. A judgment result is outputted for every pixel. That is, a white field is within the limits of predetermined [of both the horizontally (1) attention pixel was judged to be an edge field, and this attention pixel was inserted], and when this attention pixel is not the medium concentration edge field of the direction of vertical scanning, it judges with a resolution precedence field and output signal "1" is outputted.

(2) When an attention pixel is not the above (1), judge with a gradation nature precedence field and output output signal "0."

[0014] Since the example of the edge field detector 21 and the white background detector 22 is explained to JP,5-176167,A for which these people applied previously at details, explanation here is omitted.

[0015] Drawing 3 is the details block diagram of the medium concentration edge detector 23 of the direction of vertical scanning, and this detector 23 consists of filter formation circuit 23A and medium concentration edge detector 23B, and it detects whether an attention pixel is the medium concentration edge section of the direction of vertical scanning in the field of 3 pixel x2 line. That is, the detection result is as follows.

(1) When an attention pixel is the medium concentration edge of the direction of vertical scanning, output output signal "1."

(2) When an attention pixel is not the above (1), output "0."

[0016] Drawing 4 (A) forms the spatial filter of 3 pixel x2 line of "A-F" as shows the outline block diagram of filter formation circuit 23A, and filter formation circuit 23A to drawing 4 (B) using one line buffer 231. The attention pixel at this time is set to "E." Medium concentration edge detector 23B of the direction of vertical scanning judges whether attention pixel "E" is a medium concentration edge based on the value of filter formation circuit 23A to data "A-F". Criteria are shown in a table 1.

[0017]

[A table 1]

条件 1 : 3 × 2 マトリクス① : $(A < th1) \& (B < th1) \& (C < th1) \& (th2 < D < th3) \& (th2 < E < th3) \& (th2 < F < th3)$ ② : $(th2 < A < th3) \& (th2 < B < th3) \& (th2 < C < th3) \& (D < th1) \& (E < th1) \& (F < th1)$

(①|②)が真のとき、注目画素を中間濃度エッジとして、“1”を出力

(①|②)が偽のとき、注目画素を中間濃度エッジでないとして、“0”を出力

条件 2 : 1 × 2 マトリクス① : $(B < th1) \& (th2 < E < th3)$ ② : $(th2 < B < th3) \& (E < th1)$

(①|②)が真のとき、注目画素を中間濃度エッジとして、“1”を出力

(①|②)が偽のとき、注目画素を中間濃度エッジでないとして、“0”を出力

ただし、& : 論理積、| : 論理和

th1, th2, th3は閾値データ

[0018] As for the judgment of the conditions 1 of a table 1, matrix size is 3x2 among 3x2 filters, using all data. As for the judgment of conditions 2, matrix size is 1x2, using the data of "B and E." A switch of this matrix size is changed according to reading density or a manuscript. In this example, in the reading density of 200 or less dpi, conditions 2 are used and conditions 1 are used except it.

[0019] It is drawing for explaining the relation between threshold data and concentration, the threshold data th1, th2, and th3 is threshold data which can be set up from CPU, and as shown in drawing 5, drawing 5 is used for judging the connectivity of the medium concentration edge field of the direction of vertical scanning, and is maintaining the relation of "th1<th2<th3." These thresholds are switched according to reading density or a manuscript. The set point in this example is shown in drawing 6.

[0020] Drawing 7 is drawing showing the configuration of the medium concentration edge detector 23 of the direction of vertical scanning, and this detector 23 consists of filter formation circuit 23A, medium concentration edge detector 23B, and expansion circuit 23C, and it detects whether an attention pixel is the medium concentration edge section of the direction of vertical scanning. That is, the detection result is as follows.

(1) When an attention pixel is the medium concentration edge of the direction of vertical scanning, output output signal "1."

(2) When an attention pixel is not the above (1), output "0."

Filter formation circuit 23A and medium concentration edge detector 23B of the direction of vertical scanning are the same as said example.

[0021] Expansion circuit 23C carries out expansion processing to the output of medium concentration edge detector 23B using the mask of 1 pixel x3 line as shown in drawing 8. That is, if there is a pixel judged in medium concentration edge detector 23B at least 1 pixel in the mask of drawing 8 to be "1", processing which outputs "1" for the attention pixel in a mask as a medium concentration edge pixel of the direction of vertical scanning will be performed. Such expansion processing is processing performed when incorrect separation of the medium concentration edge field of the direction of vertical scanning in edge separation and white background separation is large.

[0022] Drawing 9 is drawing showing the whole image reader block diagram concerning this invention, the manuscript placed on manuscript base glass 101 is irradiated with the lighting lamp 103 constituted by the 1st mirror 102 and one as everyone knows, and the reflected light is scanned by the 2nd mirror 104 and the 3rd mirror 105 which were constituted by the 1st mirror 102 and one. Then, the reflected light converges with a lens 138, it is irradiated by CCD106 and photo electric translation is carried out to it. The 1st mirror 102, the lighting lamp 103 and the 2nd mirror 104, and the 3rd mirror 105 make the transit object motor 107 a driving source, and are movable in the direction of A.

[0023] the manuscript loaded into the manuscript tray 108 -- a pickup roller 109 and a resist roller pair -- pass a reading station B with 110, the conveyance drum 111, and the conveyance roller 112 -- a delivery roller pair -- it is sent into 113,114 and discharged on a paper output tray 115. A manuscript is irradiated with the lighting lamp 103 which is moving near the reading station B in case a reading station B is passed, and the reflected light is scanned by the 2nd mirror 104 and the 3rd mirror 105 which were constituted by the 1st mirror 102 and one. Then, the reflected light converges with a lens 138, it is irradiated by CCD106 and photo electric translation is carried out to it. the pickup roller 109 in these processings, and a resist roller pair -- 110 is driven by the feed motor (not shown) -- having -- the conveyance drum 111, the conveyance roller 112, and a delivery roller pair -- 113,114 is driven by the conveyance motor 116.

[0024] In this example, reading density conversion of main-sub independence is performed. Electric variable power performs reading density conversion of a main scanning direction. Since the number of reading pixels on drawing (rate of focusing) of a lens 138 and CCD106 is immobilization, the reading density of a main scanning direction serves as constant value. It constitutes from this example so that the reading density of this main scanning direction may be set to 400dpi. Variable power is carried out to dpi of arbitration by infanticide processing or carrying out writing twice by the electrical circuit (not shown) using line memory to the reading data in this 400dpi, performing interpolation processing. For example, in order to reduce to 200dpi, it changes into 1 pixel thinned out and carried out, carrying out interpolation processing of the 2 pixel of the ***** of 400dpi reading data. Moreover, in order to expand to 800dpi, it changes into 2 pixels by carrying out writing twice, carrying out interpolation processing of the 1 pixel.

[0025] Machine variable power performs variable power of the direction of vertical scanning. The transit object motor 107 and the conveyance motor 116 carry out density conversion by using a stepping motor and changing the actuation speed of these motors by changing the scan speed of the direction of vertical scanning of a manuscript, namely, changing the reading density of the direction of vertical scanning. For example, in order to drive a motor so that it may scan by scan speed:2xA, in order to read by 200dpi to scan speed:A in 400dpi, and to read by 800dpi, a motor is driven so that it may scan by scan speed:A/2.

[0026]

[Effect of the Invention] The effect corresponding to claim 1: Deterioration of a rendering image was able to be prevented by detecting the edge field which changes from the low concentration field of the direction of vertical scanning to a medium concentration field, and giving the judgment circuit which chooses the binary-ized processed data based on dithering or error diffusion to the direction medium concentration edge field of vertical scanning.

[0027] The effect corresponding to claim 2: Medium concentration edge field judging processing of the direction of vertical scanning of claim 1 was able to consist of a filter circuit of a mxn pixel field, and a circuit which judges the connectivity of a field, and deterioration of the above-mentioned rendering image was able to be prevented with a more sufficient precision by changing filter size according to reading density or a manuscript according to reading density or a manuscript.

[0028] The effect corresponding to claim 3: Medium concentration edge field judging processing of the direction of vertical scanning of claim 1 was able to consist of a filter circuit of a mxn pixel field, and a circuit which judges the connectivity of a field, and deterioration of the above-mentioned rendering image was able to be prevented with a more sufficient precision according to reading density or a manuscript by changing the threshold which judges connectivity according to reading density or a manuscript.

[0029] The effect corresponding to claim 4: To the medium concentration edge field judging result of the direction of vertical scanning of claims 2 and 3, by performing expansion processing of a mxn pixel, more, deterioration of the above-mentioned rendering image was prevented and precision was able to improve [deterioration] things according to reading density or a manuscript.

[Translation done.]